MY FRIEND JULIUS SCHAUDER

Jean Leray

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During the academic year 1932/33, Julius Schauder had a Rockefeller Fellowship (a very advantageous fellowship of two years' duration, which requires the recipient to stay abroad). During the five academic years 1931/36, I held a French scholarship of the Caisse des Sciences (which had just been created and was to become the C.N.R.S. [1]). It very generously made it possible for me to spend the first semester of the academic year 1932/33 with E. Schmidt and von Mises in Berlin. The day I left Berlin at the end of the term, the Reichstag was burning [2] and Hindenburg made Hitler Chancellor. The following day, while the first of Hitler's decrees abolishing various fundamental rights were being proclaimed, Lichtenstein in Leipzig kindly gave me the interview I had requested. He repeated to me the advice about reading Julius Schauder's publications which one had given me in Berlin several times. Lichtenstein, a far-sighted man, was frightened. This was going to impair his health, and he would quickly pass away.

After my return to Paris, my thesis was printed, and I could defend it. This defence satisfied me less than the examiners. It convinced me that I had to refine or change the method which allowed me to establish existence theorems without making an assumption implying uniqueness.

It so happened that both Julius Schauder and I had planned to spend the second semester of the academic year 1932/33 in Göttingen, but almost all

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the mathematicians had fled. Hans Lewy, for example, had taken refuge in Paris, where he was well-known and highly esteemed on account of his publications and his contributions in the seminar of Jacques Hadamard (Collège de France). Julius Schauder had also come to Paris.

One beautiful morning in spring, Hans Lewy introduced us to each other in a modest restaurant in the rue Soufflot. I immediately said to Julius Schauder: "I have read your paper on the relationship between existence and uniqueness of the solution of a nonlinear equation. I know now that existence is independent of uniqueness. I admire your topological methods. In my opinion they ought to be useful for establishing an existence theorem independent of the whole question of uniqueness and assuming only some a priori estimate." He replied - we were speaking German - : "Das wäre ein Satz". ["That would be a theorem"].
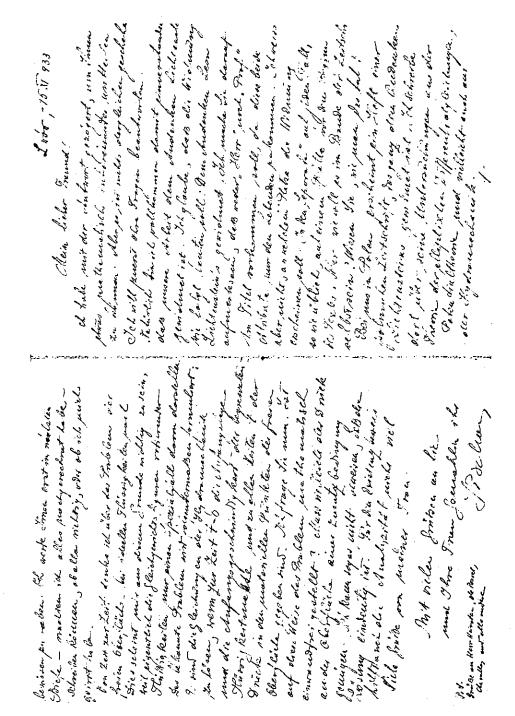
Forty-eight hours later, this theorem existed. In the beautiful Jardin du Luxembourg, the theorem was formulated and the proof worked out. It was in the same park a few days later that Julius Schauder suggested to enrich it with its best application, the existence of the solution of the Dirichlet problem for all two-dimensional convex regions, posed for the elliptic equation:

$$a(x , y , z , \frac{\partial z}{\partial x} , \frac{\partial z}{\partial y}) \frac{\partial^2 z}{\partial x^2} + 2b(\ldots) \frac{\partial^2 z}{\partial x \, \partial y} + c(\ldots) \frac{\partial^2 z}{\partial y^2} = 0 \ .$$

After fifteen days of intense work without a set back, meeting in the Jardin du Luxembourg, in Meudon, where I lived, and its woods, we had our paper "Topologie et équations fonctionnelles" summarily written up.

The summer vacation separated us. In November 1933, the only remaining question was the phrasing with which we wanted to dedicate this work to the memory of Léon Lichtenstein (see below the copy of page 1 of a letter of 15-11-1933.) But the editor of the Annales de L'École Normale Supérieure removed our dedication and added to our quotations on the first page of our paper a list of French publications without direct connection to our subject [3] . I was greatly annoyed at these two changes, and I apologized for them to Julius Schauder. I am no longer in possession of his reply, which showed his astonishment, resignation, and courtesy. Three hurried removals during the 1939/45 war caused the loss of more than one document.

What remains of our correspondence has dwindled to some fifteen letters written by Julius Schauder. The earliest one is the four page letter of 15-11-1933, pages one and four of which have been reproduced below to

Page 1 and page 4 of a letter (15-11-1933) written by J. Schauder to J. Leray .

render homage to Léon Lichtenstein. Pages two and three point out the
necessity of rectifying an a priori estimate given by Serge Bernstein,
which I succeeded to do in 1937/38. They also mention our friend
Hans Lewy, to whom we were deeply grateful for taking an interest in
our joint work and for making it widely known. Finally, they announce the
very beginning of Julius Schauder's research into hyperbolic equations
even before he had verified the results (see top of page 4).

The other letters contain:

- statements of results, one of which is particularly important and
  has unfortunately not been published by Julius Schauder; the
  possibility of extending the theory of topological degree to locally
  convex vector spaces (March 1935);
- sketches of some attempts which he gave up;
- announcements of various publications of his;
- an authentic report on the Moscow "Congress of Topology" in 1935,
  in which he gives evidence of very sound judgement and great breadth
  of mind, analysing with penetration the capabilities and limits of
  everyone, whether they were admirably great or somewhat narrow
  (2-12-1935). While recognizing the great importance of the definition
  of homotopy groups given by Hurewicz, Julius Schauder notes with
  regret (page 2): "Die Untersuchungen sind im allgemeinen nicht auf
  die Anwendungen zugeschnitten und die dort anwesenden Mathematiker
  interessierten sich nur für die Topologie als solche." ["In general,
  the studies are not geared to applications, and the mathematicians
  present were only interested in topology as such."]. He adds a note
  at the bottom of this page: "Ich habe immer unterstrichen, daß ich
  kein Topologe bin." ["I have always stressed that I am not a
  topologist."], and somewhere else (8-7-1936, page 1), "Ich bin,
  so wie Sie, ein Mann der Anwendungen." ["I am like you a man of
  applications."];
- some information on the Oslo Congress;
- comments to some of our publications, in particular to the ones following
  our joint paper: We generalize the definition of the topological
  degree given by Brouwer, without explaining the details of this
  definition and without proving its properties; however obvious
  they may be, we must check them scrupulously (23-2-1935).

Lwów,8.7. 1936.

Mein lieber Freund!

Ich bin im Momente mit der Vorbereitung meines Referates für Oslo beschäftigt. Eine Arbeit über hyperbolische Differentialgleichungen,die ich zum Drucke vorbereite,wird wahrscheinlich vor der Abreise nicht mehr fertiggestellt werden können.

Ich bin mit Ihrem Vorschlag eine gemeinsame Arbeit zu schreiben vollkommen einverstanden. Ich bin so wie Sie ein Mann der Anwendungen,für welche unsere Arbeit aus E.N.S. bereits genügt. Die Bemerkungen aber,die verschiedene Mathematiker fallen lassen,zwingen mich denselben Standpunkt wie Sie anzunehmen. Ich mache Sie aber aufmerksam,dass wir in der vorgeschlagenen Arbeit noch mehr leisten sollen. Es ist meiner Ansicht nach möglich auch nichtlineare und nichtkompakte Räume zu betrachten /sogar ohne Gruppeneigenschaft/.

Die traurige Frage ist nur: wann werde ich Zeit haben um darüber nachzudenken? Ich bin jetzt von dem Unterricht in der Schule,der erst am 30 Juni beendet wurde,furchtbar erschöpft und müsste eigentlich /mein Arzt verlangt es/ ausruhen. Ich will aber unbedingt meine Untersuchungen über hyperbolische Differentialgleichungen zum Drucke vorbereiten. Es sind drei Arbeiten,die von: 1/ gemischten Randwertaufgaben für quasilineare Differentialgleichungen / ein allgemeineres Problem als das Cauchy'sche/ 2/beliebigen nichtlinearen Differentialgleichungen /gemischte Randwertprobleme/ und 3/ Systemen von Differentialgleichungen erster Ordnung handeln; alles in n unabhängigen Veränderlichen.Dies ist auch der Inhalt meines Vortrages in Oslo. - Und am ersten September fängt die Hölle in der Schule schon wieder an!

Zu dem allem weiss ich nicht,wie sich meine Zukunft gestalten wird. Meinem Alter nach sollte ich schon eigentlich Professor sein;in meinem Vaterlande ist aber die Lage für mich persönlich vollkommen hoffnungslos. Da ich schnell den Grif befördern will, so schreibe ich nichts über die Einzelheiten,die mir sowieso sehr peinlich sind.Ich müsste unbedingt 1 oder 2 Jahre frei haben um sich mit der Mathematik beschäftigen zu können. Ich fühle, dass ich da noch etwas zu sagen habe. Vor einigen Wochen hat H.Steinhaus,einer der Professoren in Lwów sich in meiner Angelegenheit an H.Hadamard gewendet. H.Hadamard wurde gebeten meinen Versuch,wenigstens für ein Jahr nach Nordamerika zu kommen,zu unterstützen. Mein Traum wäre dort überhaupt bleiben zu können. Wie ich gehört habe,wurde in Princeton darüber gesprochen,mich für einige Zeit einzuladen. Es würde sich also darum handeln,die Sachen kräftig zu fördern. Ich bitte aber Sie und auch H.Hadamard,wenn Sie vielleicht mit

Page 1 of a letter (8-7-1936) written by J. Schauder to J. Leray .

"Ich mußte erklären, daß bei Fixpunkten [es] sich um eine Abbildung
einer Menge auf sich selbst handelt, während dies bei topologischem
Grad nicht sein muß." ["I had to explain that for fixed point theorems
the mapping has to be to itself, whereas this is not necessarily the
case with the topological degree."] (2-12-1935, pages 6 and 7);
- the hope that our correspondence and new meetings would enable us
  to collaborate again;
- some brave and clear-sighted references to the difficult, unfair,
  and finally dangerous character of his personal circumstances.

All these letters are very friendly, warm, and absolutely confidential.
I would betray Julius Schauder's confidence if I passed them on to a
third person in greater length. Furthermore, they could not be
correctly interpreted unless I added a detailed commentary.

At a Colloquium in Geneva organized in 1935 by Robin Wavre and
chaired by Jacques Hadamard, I had the great pleasure of seeing
Julius Schauder again. In 1938, towards the end of spring, a mission to
the Institute Français in Warsaw allowed us to meet in Lwów a third time.
We did not, however, succeed in writing another joint paper as we had
hoped.

When we met through Hans Lewy, we had been unconsciously preparing
our collaboration for a long time. Our methods and intuitions complemented
each other. Very quickly each of us knew the other's thought well enough
to solve without discussion the many problems not yet solved.

I cannot explain the nature of our exchanges except by analysing one
of them, for example, the one concerning the extension of the Jordan-
Alexandroff theorem to Banach spaces:
If two closed subsets F and F' of a Banach space B are homeomorphic
images of each other with $x \to x + F(x)$ such that F is compact,
then $B\backslash F$ and $B\backslash F'$ have the same number of connected components.
In 1933, Julius Schauder thought that this statement was probably true,
its proof, however, difficult. He told me so. In 1935, when preparing
my lecture on the theory of the topological degree at the Cours Peccot
(Collège de France), I calculated the degree of a composite map and
concluded from it an extremely simple proof of that extension of the
Jordan-Alexandroff theorem. I drafted a note for publication in the
Comptes Rendus de l'Académie des Sciences. It would have been tactless
to say that what Julius Schauder had conjectured could be proved so
easily. It was polite and scientifically correct to present this paper
as a simple by-product of our joint article. I asked Julius Schauder to
scrutinize it. His reaction proves the high quality of his character.
Considering it to be quite superfluous to mention that he had
conjectured what I had proved, he replied (23-2-1935, in French):
"Il me fait grand plaisir que vous pouvez généraliser et compléter la
théorie d'une manière si belle et élégante. Les différentes phrases où
vous confrontez vos résultats avec les anciens portent témoignage de
votre trop grande modestie . . . C'est vraiment étonnant qu'on peut
obtenir le théorème d'Alexandroff d'une manière si élégante et facile
et - si je dois être sincère - c'est même inquiétant pour moi (*);
mais je ne suis pas capable de trouver des fautes." ["It gives me great
pleasure that you can generalize and complete the theory in such a
beautiful and elegant manner. The various sentences where you compare
your results with the conventional ones bear witness of your far too
great modesty . . . It is really amazing that one can obtain the
Alexandroff theorem in such an elegant an easy manner, and, if I must
be honest, it is even disquieting for me; but I am not able to find
any mistakes."]. In the report on the Moscow "Congress of Topology",
which he sent me on 2-12-1935, he wrote: "Ich habe die Bekanntschaft
aller führenden Topologen gemacht und erzählte ihnen von Ihrem schönen
Ergebnis (C.R. Note)" [4] , ["I met all leading topologists and told
them of your beautiful result"], attributing to me a merit that was
partly his own. He expresses himself with such clarity and enthusiasm
that the one of these topologists whom we revere most says to him:
"Ich schäme mich sehr, es für den endlich-dimensionalen Fall nicht
bewiesen zu haben." ["I am ashamed not to have proved it for the
finite-dimensional case."]. The aim of these quotations is obviously not
to establish the modesty which Julius Schauder attributes to me, but to
bear witness to his character which was highly sensible, very scrupulous,
thoroughly honest, and truly unpretentious.

(*) The context shows that one must understand: "inquiétant à mon avis"
    ["disquieting in my opinion"].

Hel, 8. VII 1936.

Mein lieber Freund!

[handwritten German letter text]

Part of a letter (8-8-1936) written by J. Schauder to J. Leray .

And yet, he had at that time a real need of scientific prestige; the anti-semitism of the Pilsudski regime, increased by Nazi contamination, forced him to work in difficult conditions. Although Privatdozent at the university, he had to teach in a grammar school for a living. He wrote to me on 4-4-1934: "Die Ferien sind die einzige Zeit, wo ich etwas freier bin." ["The holidays are the only time when I have some spare time."]. He informs me of his situation in detail in his letter of 8-7-1936, the first page of which I believe I can make known (see copy below; the end of the last sentence is "ihm über mich sprechen, um Diskretion."). I want to be discreet and will not quote the entire letter. I suggested to him to accept an offer by Serge Bernstein inviting him to come to Leningrad. I could not foresee the martyrdom this city would undergo. He replies to it on 8-8-1936, at the bottom of page one (see copy below). He knows that France is an uncertain asylum, already submerged. The U.S.A. are his only hope. On 11-1-1938, he writes me a letter whose beginning (copy below) shows despair. I would visit him in Lwów in June 1938. The future would become so dark that we would no longer write to each other.

In 1939, after the conquest of Lwów by the Soviet armies, he was visited by I. Petrowsky and S. Sobolev.

In 1941, after the German conquest, he had to go into hiding. I learned from a Polish source that he was the victim of an informer who was tried and executed immediately after the end of the war.

MADAME JULIUS SCHAUDER

The flat in Lwów, where Julius Schauder, his wife and their newly born daughter Eva lived in 1938, was modern, comfortable, and in good taste. Julius Schauder was backed up by his wife with much devotion..For example, his typed letter of 8-7-1936 contains the note: "Ich habe den Brief der Eile wegen meiner Frau zur Schreibmaschine diktiert." ["Because I am in a hurry, I dictated the letter to my wife for typing."]. From now on, his letters would often be typed.

I learned from a Polish source that under the German occupation Madame Julius Schauder hid with her daughter in a cellar where water came in and where Eva fell seriously ill. Madame Julius Schauder then

Lwów, den 11 I 938.

Mein lieber Freund!

Von meinem letzten Brief an Sie ist bereits ein halbes Jahr verstrichen.
Der Grund aus welchem ich Ihnen nicht geschrieben habe ist immer derselbe: meine
professionelle Beschäftigung lässt mir keine Zeit für die Mathematik übrig. Ausser-
dem werden Sie leicht begreifen,dass die Atmosphäre,die jetzt bei uns herrscht,mich
sehr nervös macht und ich kaum meine Gedanken von den laufenden Ereignissen los-
reissen kann, Jede Wissenschaft aber und insbesondere die Mathematik verlangt
ausser freier Zeit noch viel Ruhe und Konzentration. Die jetzigen Zeiten sind aber
wirklich nicht denach.

Ich habe alle Ihre Sendungen wohl erhalten,insbesondere Ihre beiden C.R. Ko-

Part of the last letter (dated 11-1-1938) written by J. Schauder
to J. Leray .

gave her daughter into the custody of a catholic convent, allowed herself
to be discovered by the Nazis, and disappeared.

EVA SCHAUDER

Immediately after the war, in 1945, Madame Lene Kuchler, a woman of
action and heart, whose entire family had disappeared, gathered as many
Jewish children as possible, who had been entrusted to catholic convents
during the occupation. She wanted to search for their families and give
the children a Jewish education. The orphanage she had founded in Poland
in the Tatra mountains was the target of attacks: groups of Nazis
survived in the mountains. In deep winter all windows were broken. With
approximately a hundred or less of these children she took refuge in
France, in Bellevue near Meudon.

She looked after Eva Schauder, knew that her father was a mathematician
and believed him to be professor at some grammar school. On making
inquiries in February 1948, she contacted Harry Zeimer, an engineer
at l'Ecole Centrale. He remembered the Colloquium in Geneva (1935), wrote
to his former professor, Robin Wavre, who wrote to me. I informed
H. Steinhaus (Wroclaw), who (in March 1948) informed Eva's family:
a cousin, Dr. Joseph Bratter, in Wroclaw;
other cousins in the U.S.A.;
Professor Mario Schauder, in Pisa (Italy), the brother of Julius Schauder.

Eva was ten years old, seriously ill, had undergone one operation in
Poland, and had to undergo a second one at the Hopital Laennee (Paris).
My wife and I visited her at the hospital, where, in a few weeks, she had
learned French. She was very attached to the memory of her father, of
whom I could give her some photographs. She was a very intelligent and
deeply moving little girl.

In April 1948 Madame Kuchler gave me her news. After the summer
vacation I telephoned her in vain. I made a trip to Bellevue and found
that the orphanage was no longer there. I wrote to Mario Schauder,
without receiving a reply. I wrote to him again, in vain. Then I was
afraid to become indiscreet. I know from an Italian source that he died
some years later. To my great regret, I never again had any other news
of Eva Schauder.

EDITOR'S NOTES:

1) C.N.R.S. = Centre national de la recherche scientifique.

2) "Reichstagsbrand" : 27-2-1933.

3) J. Leray et J. Schauder;
    Topologie et équations fonctionnelles,
    Annales l'Ecole Normale Supérieure 51, 45-78 (1934).

The publications in question are the references (29) on page 67 of
the paper cited above. The original reference (29) contained only
E. Gevrey's paper. All of E. Picard's papers appearing in reference
(29) were added. At the time E. Picard was Directeur of the
Annales.

The dedication to Léon Lichtenstein should have read (to be
inserted after the title of the paper and after the names of
the authors):

"Dédié à la mémoire de Léon Lichtenstein."

(communicated by J. Leray to W. Forster).

There is another paper

J. Leray;
Discussion d'un problème de Dirichlet,
Journ. de Math. 18, 249-284 (1939),

which has a list of publications of E. Picard on the first page.
E. Picard was at the time editor of the Journal de Mathématiques.

4) J. Leray;
    Topologie des espaces abstraits de M. Banach,
    Comptes Rendus de l'Académie des Sciences 200, 1082-1084 (1935).

Translation:

Translation from the French original by B. Forster and W. Forster
with the kind permission of J. Leray.